STRATEGY RESEARCH PROJECT

NETWORK CENTRIC OPERATIONS AND THE NAVY'S SH-60R: STRATEGIC FORCE MULTIPLIER

BY

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USAWC CLASS OF 2001

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ABSTRACT

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TITLE: Network Centric Operations and the Navy's SH-60R: Strategic Force Multiplier

FORMAT: Strategy Research Project

DATE: 10 APRIL 2001 PAGES: 32 CLASSIFICATION: UNCLASSIFIED

Naval Aviation, in particular its helicopter communities, is undergoing a radical, possibly revolutionary, transition. The primary focus in this paper is the application of the network centric operations (NCO) concept to the emerging Maritime Concept, using the impending introduction of the SH-60R "Romeo" as one of the first implementers of NCO as a significant example.

The U.S. Naval helicopter community's Helicopter Master Plan and the Naval Aviation Roadmap combined with associated concept studies and published policy statements by Naval leaders provide the background we need to determine the feasibility of applying NCO to a programmed weapon system. It is the opinion of the writer that the NCO concept needs to be applied and integrated into naval aviation and surface assets from the beginning of their design and manufacture, not after their deployment to fleet units.

But does the understanding of the potential impact of NCO upon future force structure and operations go beyond just a few "techno-geeks" and far-sighted flag officers? For example, Vice Admiral Arthur K. Cebrowski, USN, the current President of the U.S. Naval War College, is an extremely aggressive proponent of a vision of universal situation awareness brought to fruition through the application of NCO on future acquisitions; can this vision achieve reality? Do Naval Aviation helicopter procurement plans adequately address the inclusion of technologies deemed necessary that will provide new helicopters access into network centric operations?

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PREFACE

Network Centric Operations have been the passion of Vice Admiral Arthur K. Cebrowski for a number of years. He has successfully inculcated this concept into Navy thinking as an effective way to fight future wars, harnessing the power of information technology. How the Navy is to implement NCO in an age of stagnant budgets and uncertain threats is reflected in an increasing number of strategic and doctrinal publications currently produced by the Navy and other defense-related institutions. The draft Maritime Concept rightly focuses on the advantages that prompt incorporation of NCO into all aspects of the sea service will provide; it remains a matter of time whether or not enough momentum builds to see the Network Centric Operations Concept to fruition.

The Revolution in Military Affairs is alive and well in the U.S. Navy, but it will take foresight and energy to ensure that the three legs of the RMA triad are brought together: the doctrine, technology, and the organization.

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NETWORK CENTRIC OPERATIONS

Network Centric Operations. NCO. A wide variety of official and unofficial documents provide the outline for the Navy's transition from platform-centric to network-centric operations. Originally referred to as "Network Centric Warfare", Network Centric Operations now encompasses a wider variety of scenarios and activities than originally envisioned. NCO is currently the hot "bumper sticker" buzzing through the U.S. Navy staff as well as the Department of Defense and Congress, gathering momentum with every passing POM. It is a concept embraced by the Navy and our sister services as a significant force multiplier in future operations. VADM Arthur K. Cebrowski stated in the Winter 2001 edition of Naval War College Review that "network-centric warfare develops and enables information superiority, stresses operations in multiple domains including space and cyberspace, accepts the highly complex and chaotic environment, and assumes that there will be a great diversity of players (friends, foes, and neutrals or noncombatants)."[1] Thus, naval strategy and policy thinkers recognize that a smaller and widely dispersed Navy must be more integrated – sensors, shooters and communicators – in order to allow commanders and subordinates to possess the requisite situational awareness to fight effectively while geographically dispersed. NCO is intended to eventually replace the historical emphasis on platform-centric operations and capabilities.

It is important to note that Network Centric Operations have been given much-needed visibility both within the Navy and on Capitol Hill, as evidenced by funding increases which were requested by the Navy's Space and Naval Warfare Command (SPAWARS)[2] and then placed in the Navy's budget to do research, development and procurement in association with the Navy's Information Technology–21 (IT-21) program. IT-21 is an "overarching or umbrella capability for the implementation"[3] of Network Centric Operations and the maturing Maritime Concept for naval forces. Recently funded, IT-21 is to provide information exchange (video, voice, data, imagery) among all friendly units. As envisioned, the IT-21 program is a compilation of diverse systems that utilize both Commercial and Government Off-the–Shelf Systems (COTS and GOTS) to leverage the rapid pace of information technology into a viable C^4I network, with installation to be completed by FY '03; IT-21 is a significant force enabler.

As a result of changes in the strategic and resourcing environments, the Navy is turning increasingly to a future generation of manned and unmanned aircraft, of which the SH-60R is one of several that will serve as an integral component of the NCO architecture. The ability to

have multiple assets operating in a dispersed geographic area, all linking a variety of advanced sensors, will allow surface and subsurface units and their overarching staffs (as well as Joint and coalition forces) a synergistic and focused picture of the battlespace. The legacy navy[4] has impressive striking power but must be able to employ improvements in information technology and flexible command organizations in order to operate within an adversary's sensor and engagement timeline. Network Centric Operations, utilizing the new Maritime Concept, will be the linchpin that links shooters, sensors, and commanders, near and far, in order to provide the knowledge required to attack rapidly an adversary's critical vulnerabilities, avoid strengths, and destroy his center of gravity.[5]

A PRIMER ON NETWORK CENTRIC OPERATIONS

With the implementation of Network Centric Operations a reality, a vast assortment of sensors will provide situational awareness on two levels. First, Joint Force and fleet commanders will now have a comprehensive overview of their theater of operations, revealing necessary tactical, operational, and strategic patterns. Second, this network of sensors will provide detailed tactical information (data and intelligence) to the carrier battle group or maritime action group in order to support maneuver, engagement, and follow-up operations by assigned indigenous units, in accordance with Navy doctrine. Today's naval forces already have a great ability to build and share digital awareness of the air and sea-surface battlespace, using experience built upon the Navy Tactical Data System (NTDS) and the Joint Tactical Information Distribution System (JTIDIS). The future Navy must extend this level of awareness to the more difficult land and undersea environments.[6]

Network Centric Operations are based, in part, on the "principle of self-synchronization."[7] Self-synchronization emerges when units within a force use common information, the commander's intent, and a common rule set – or doctrine – to self-organize and accomplish the commander's objectives.[8] Controlled by a 'commander's intent' and possibly inflexible rules of engagement, tactical-level leaders use "shared awareness and initiative to create and exploit opportunities."[9] Tactical units will be able to self-synchronize their actions, thus minimizing the delays inherent in centralized control. Self-synchronization enables the force, organized into combined arms tactical teams, to work as a synergistic whole, enhancing speed of maneuver and responsiveness.[10]

Finally, a short discussion on an additional but highly relevant concept: Effects-Based Operations (EBO). This concept has been increasingly explored by a majority of senior war colleges, as well as defense think tanks, as a way to do more with less. EBO emphasizes rapid

maneuver (characterized in emerging doctrine as Rapid Decisive Operations – RDO)[11] that "creates unacceptable change from the adversary's perspective using effects directed as much against an enemy's will as well as physical targets. A devastating tempo negatively impacts the opponent; no longer is reliance on rapid maneuver or decisions by warfighters absolutely required."[12] Network centric-enhanced forces will employ EBO to rapidly shape or hinder enemy behavior, interdict their tempo and break the cohesiveness of hostile forces, disrupting his plans."[13]

Although network centric and effects based operations can provide important warfighting benefits when applied separately, it takes both of them together to achieve the full potential of Network Centric Operations. The underlying theme prevalent throughout various studies is that there must be changes in the way the Navy collects, exploits and distributes information. Implementing these changes can dramatically improve a commander's ability to achieve significant situational awareness.

NCO allow commanders at every level to focus resources on the task or mission while making allowance for initiative by subordinates – centralized control, decentralized execution. Organizational designs must be developed or re-developed to meet network-centric functional requirements. Network Centric Operations will include extensive organic sensor development and employment, increased use of operational maneuver and deception, engagement and EBO, information operations, network defense, and command and control for self-synchronized tactical teams.[14] A network centric force requires "off-board sensing capabilities, third party targeting, and weapons"[15] that can be swiftly updated by the unit having the best available information. Sensors will provide much of the capability found in current expendable weapons. Additional future enhancements intended for the fleet include "battlegroup-level decoys, electronic warfare, directed energy systems, and tools to attack data link, communications, sensor, and information systems."[16]

In summary, Network Centric Operations are focused more on achieving a "politically viable endstate"[17] and undermining an opponent's warfighting capabilities rather than simply conducting attrition warfare. Therefore, battle damage assessment will be augmented by other measures of effects, new and relevant metrics.[18]

FUTURE CONFLICTS USING NETWORK CENTRIC OPERATIONS

In a network centric operation, a Naval force commander will first use a wide variety of inter-connected sensors (located on shore, in space, or fleet-based) to expand the information and intelligence base and assemble an information advantage over the adversary.

Simultaneously, dispersed naval units will employ offensive information-based operations to break down the opponent's information systems and networks.[19] The result for the enemy is a situation where they have increasing demands for knowledge concurrent with his loss of sensor and weapons capabilities.

If any resistance is expected, naval operations in the littoral may begin with "a stealthy approach using battle group-level deception, weather, and darkness"[20] in conjunction with extensive information operations. Naval units, consisting of the full range of combatants, tactical and patrol aircraft, unmanned aerial vehicles (UAV) and helicopters, will introduce sensors, decoys, and countermeasures into the battlespace to prepare the way for an overwhelming effects-based attack.[21] UAVs are to be controlled by both surface, subsurface and aircraft (including the SH-60R, a helicopter based on any navy surface combatant ship such as a frigate, destroyer, cruiser, or aircraft carrier) through interfaces being developed (such as the Tactical Command System, TCS). Sensors and unmanned vehicles will assess combat effects, provide target-quality tracks on new targets, and monitor adversary actions. Long-range standoff weapons will engage fixed targets as needed throughout the operation. Early conventional and information operations strikes will target enemy surveillance, information, and defense systems, creating an area to which the adversary is denied access and from which campaign objectives can be achieved. To be effective in the close-in littoral, the future Navy must be "tactically stable through dispersion of its combat power,"[22] thereby coupling unit survivability with power projection capability.

A force that can effectively operate in littoral waters (loosely defined as the coastal waters from which naval forces can effectively project power, nominally 300 nautical miles) must be characterized by speed, maneuver, endurance, and improved force-protection and platform survivability. The future Navy will deploy a blend of competent forces that includes geographically dispersed platforms.

However, successful implementation of NCO requires a Revolution in Military Affairs (RMA).[23] The American military as a whole is trying to come to grips with changes in how to field and fight armed forces against enemies and threats not yet envisioned. This RMA has been widely defined as a 'triad' composed of three fundamental aspects: doctrine, technology, and organization (or reorganization). The Navy, too, has recognized the impact of information technology in the new millennium and has rewritten its doctrine to reflect this impact. The name of its new doctrine:

THE MARITIME CONCEPT

Important aspects of future naval forces and doctrine have been described in several vision statements including *Joint Vision 2010* and *2020; . . . From the Sea; Forward . . . From the Sea; Operational Maneuver from the Sea;* the draft *Maritime Concept,* and the Navy's vision, *Anytime Anywhere: A Navy for the 21st Century.*

Tying these diverse visions and policies together are: the *National Security Strategy '99* provided by the President and which outlines a broad approach to "enhance America's security, bolster prosperity, and promote democracy through active engagement abroad in partnership with allies and friends;" and the Chairman of the Joint Chiefs of Staff's *National Military Strategy '97* which supports the goals and objectives cited in the NSS and further describes the application of military power to help *shape* the international environment and *respond* to dangers, while *preparing* for an vague future. All of the preceding documents note that naval forces have traditionally been suited to support each of these strategies by: maintaining a forward presence in peacetime; the ability to provide immediate crisis response if and when a crisis erupts; and to fight and win in the event of hostilities.[24]

However, a decade after the fall of the Soviet Union and the lack of a near-peer competitor in economic and military capabilities for an estimated twenty years, a realistic net assessment of future adversaries and risks needed to be undertaken so that the right balance between resources and strategy could be achieved. The Navy's vision of the early 90s *...From the Sea* shifted from a "blue water" focus, where there is no longer a threat, into the littorals where most of the world's population resides along with the majority of world capitals, and where most conflicts traditionally occur. The strategic concept *Forward...From the Sea* of 1994 further evolved this strategy of using the Navy to assist national security by utilizing sea-borne expeditionary forces forward deployed and readily available for combat during peacetime, crisis, and war.

The Maritime Concept introduced by OPNAV N3/5 in April 2000 further enhances the littoral focus of these preceding documents and, more specifically, describes the organizing principles, operational concepts and priorities by which future naval forces will exploit new technologies, organizations and capabilities.[25] These concepts and principles are identified as necessary to 'operationalize' NCO and EBO and will ensure a future Navy that will provide substantial influence globally, and control access in these regions important to the United States and its allies in the decades to come.[26] By maintaining a "robust and scalable forward presence, and with superior knowledge of the battlespace, the Navy can continue to achieve its ultimate objective: projecting U.S. power and influence from the sea to directly and decisively

influence events ashore throughout the spectrum of operations."[27] This statement permeates a number of current naval policy papers, including the "Network Centric Operations" capstone concept paper and Garstka's Network Centric Warfare.

The overwhelming majority of America's global trade, over ninety percent, continues to move by traditional sea routes (ninety-nine percent of global trade moves via existing sea lines of communications - SLOCs), and "freedom of the seas" remains the Navy's heritage.[28] The classic objective of our nation's overall maritime strategy is to influence the political, military, and economic interests ashore. Traditionally, the Navy could only pursue this maritime strategy indirectly by first winning or denying command of the seas; naval forces were therefore only available to directly affect a land campaign on a sequential, or secondary, basis.[29] But the Navy's contribution to national security has broadened since the end of the Cold War.

The U.S. Navy must achieve initial success in the fight for "information and knowledge advantage."[30] As previously discussed, to win convincingly in future wars, warfighters will use Network Centric Operations to build a common understanding of the battlespace and distribute timely intelligence and information, then use EBO to exploit potential adversaries. This process will allow warfighters to get inside the enemy's decision loops (commonly called the OODA loop - 'observe, orient, decide, act'. A term originally used by U.S. Air Force Colonel John R. Boyd to portray the cyclical nature of aerial dogfights; today it is applied to decision-making process in general)[31] and may win the battle at reduced cost.

Traditional Navy roles – forward presence, deterrence and reassurance, crisis response, and projection of combat power[32] will continue to support the National Security and National Military Strategies. Engagement will continue overseas in affiliation with friends and allies, regardless of who is in control of the Administration. Seapower, sustained access to important regions, space-based support, and cyberspace operations will continue to be critical prerequisites for any overseas operation. Mobility and maneuver – the inherent strengths of naval forces – will remain national capabilities.

Studies conducted by JFCOM, the Navy staff, and innumerable defense-oriented think tanks[33] effectively illustrate that naval operations will occur in the littorals of an increasingly less stable, more politically fragmented world created by continued economic globalization, uncertain international ties, and increasing numbers and influence of non-state actors.[34] In a time of decreasing access to overseas infrastructure and greater emphasis on littoral operations by U.S. forces, the increasing reach of the enemy's weapons may be able to challenge our battlespace depth. Furthermore, the Navy must be prepared to counter regional area-denial

strategies and potentially lethal asymmetric attacks at any point along strategic lines of communication.

In the future, potential adversaries may have technological parity with the United States,[35] so the Maritime Concept recognizes innovative operational concepts as our decisive combat advantage - NCO. Naval forces, in conjunction with our sister services, are in the midst of a shift in operational concepts in which the warfighter uses effects based operations, far-reaching sensors, and consistent, precise engagement.

However, as mentioned in the previous paragraphs which covered the upcoming doctrinal treatment of naval operations, there are two additional components of RMA which are needed to bring this revolution to fruition: the technology and organization. The next section will briefly look at the evolution of naval shipboard helicopters and how the U.S. Navy is endeavoring to integrate its next generation of helicopters into the Maritime Concept.

NAVAL HELICOPTERS AND NCO TECHNOLOGY

THE SH-60B: LINKING PAST AND FUTURE

The U.S. Navy has had over fifty years of experience with helicopters deploying aboard warships. In November 1948, the Chief of Naval Operations authorized conversion of all new-construction cruisers to accommodate helicopters.[36] This act provided the genesis for the highly successful LAMPS (Light Airborne Multi-Purpose System) program, providing for integrated shipboard facilities in support of rotary wing operations. The current Helicopter Anti-Submarine Squadron Light (HSL) squadrons trace their origins to the mid-1960s, when Drone Anti-Submarine Helicopters (DASH), equipped with an early generation of air-dropped torpedoes, were first deployed aboard the FRAM-conversion destroyers.[37] As a result of this "real world" experience, the Navy determined that manned helicopters performing a variety of missions were a necessity. Despite the variety of demanding missions, command and control over these helicopters was still rudimentary, limited to voice communications over UHF, FM and VHF and the use of shipboard radars with limited range to track the location of helicopters.

Today, the U.S. Navy flies the SH-60B Seahawk (LAMPS Mk III) aboard its cruisers, destroyers and frigates, a direct descendant of the earlier "choppers". Also used for a multitude of missions, the SH-60B was fielded with a sophisticated (for the period) array of communications as well as a data link with its "mother ship," allowing improved control but still not allowing the sharing of sensor data to other users in the theater.

The Seahawk has served the Nation well as a "platform centric" weapon system. With the force-multiplying capabilities evident in the proliferation of information technologies, the Navy is preparing to introduce the second leg of the triad of the RMA: the technology.

THE SH-60R AND FUTURE NAVAL OPERATIONS

> "We have embraced Network Centric Operations as the organizing principle of our Navy."
>
> —ADM Jay L. Johnson, CNO (1997-2000)

This simple statement in 1998 set the policy for the future of the Navy and its aviation branch. The SH-60R Seahawk, more commonly referred to as the "Romeo,"[38] the follow-on replacement for the SH-60B, has been selected by the Navy to be one of the first platforms that will capitalize on the concepts discussed in detail in the preceding sections on Network Centric Operations and the Maritime Concept. The impressive evolution of this helicopter has allowed the Navy to seriously consider a paradigm shift in how it approaches naval helicopters and their utilization. Viewed for decades as a "poor sister" to the more elite tactical aircraft (TACAIR), the embarked naval helicopter has seen its assigned missions and deployed utilization increase dramatically as the rotary wing technology matures.

The Romeo's predecessor, the SH-60B, was specifically configured in response to the U.S. Navy's LAMPS III requirement. The contemporary LAMPS MK III system had been developed to further combat a Soviet fleet viewed as a "blue-water" threat. This threat centered on the large Soviet submarine force and considerable numbers of missile-equipped surface ships; LAMPS III served to extend the search and attack capabilities of destroyers, frigates and cruisers in order to counter perceived Soviet strengths.

Within the next two decades, the U.S. Navy helicopter fleet will almost assuredly be composed of two H-60 versions – the SH-60R and the MH-60S (a modification of the Army's Blackhawk, the MH-60S is a multi-mission helicopter dedicated to shipboard utility operations aboard both aircraft carriers as well as underway replenishment ships. Additionally, the MH-60S will also be outfitted a datalink, allowing its aircrew to more fully integrate into the battle group.) The Helicopter Master Plan of the 1990s argues for the remanufacture of the SH-60B (as well as those Seahawk-series helicopters that are part of the carrier air wing, the SH-60F and HH-60H - these aircraft provide inner zone antisubmarine warfare defense as well as plane guard,[39] combat search and rescue (CSAR) and general utility duties) into the more versatile SH-60R configuration that will meet Navy (including NCO) requirements through 2020-25. When fielded,

the SH-60R will combine the traditional mission areas of the SH-60B and SH-60F/H, but will be much more capable. With the Navy's helicopter antisubmarine (HS) and helicopter antisubmarine light (HSL) squadrons operating the same helicopter, adjustments in the force structure will emerge, such as reducing the number of fleet readiness squadrons that support the SH-60 fleet as well as reorganizing how these units deploy and support the fleet. As planned in early 2001, the distinction between the HS and HSL communities will eventually begin to evolve and then disappear altogether.

The Navy currently has funded the conversion of all SH-60B LAMPS Mark III helicopters, along with the SH-60F, to the multi-mission Romeo configuration.[40] This version will be physically similar to previous models but there the resemblance ends. The Romeo will possess an impressive array of advanced sensors: an inverse synthetic aperture radar (ISAR), new electronic support measures (ESM), and the airborne low frequency dipping sonar (ALFS) and associated commercial-off-the-shelf (COTS) acoustic processor.

However, the heart of the remanufacturing program is found in the modern avionics suite upgrade. Leaping ahead of a generation of technology, the SH-60B's 1970s systems will be replaced with state-of-the-art avionics and include: improved mission and flight displays; an advanced flight control computer; a computer-facilitated integrated self-defense system; redundant GPS *AND* inertial navigation system (INS); and most importantly to this essay, a common tactical data link (CTDL) discussed in a future section.

The timeline is such that all of the existing SH-60Bs will have been converted to Romeo standard by 2011.[41] This tracks nicely with the introduction into the fleet of increased numbers of DDG-51 Flight II destroyers, equipped with complete helicopter facilities, and of the DD-21 ZUMWALT-class land attack destroyer, programmed for introduction around 2010.

SH-60R CAPABILITIES

The SH-60R multi-mission upgrade, when introduced in mid-decade, will bring notable improvements to the SH-60 B/F/H helicopters now in the fleet. The SH-60R program will give the Seahawk a service-life extension to 20,000 flight hours, equating to approximately 20 years of flying, and provide a platform capable of conducting undersea and surface warfare for the next 20 to 25 years,[42] as an effective implementer of NCO (see following section on NCO implementers). This upgrade improves the capability of LAMPS MK III to provide carrier battle group protection and to add significant capability in coastal littorals and regional conflicts, as required by the Maritime Concept. The SH-60R's systems and the systems to which it is networked will be able to deal with large numbers of air and sea contacts (numbers that are

currently classified) in a confined space and in shallow waters. The new generation Seahawk will operate with the carrier battle group or with a maritime action group, providing air surveillance as needed. The upgrade represents a significant avionics modification to the Navy's H-60 series aircraft enhancing ASW, ASUW, surveillance and power projection, supporting operational requirements. The SH-60R is scheduled to reach operational capability in 2005.

THE KEY – THE CONNECTIVITY FOR NCO INTERFACE

The 'Romeo" platform is just a part of the overall technological piece meant to actualize NCO. The key to making everything work is the connectivity, the "black boxes" needed to tie the aircraft into the network. Without this connectivity, the Romeo would just be a platform centric asset unable to optimize changes in future organization and doctrine. Fortunately, integration issues have been a major part of the research and development of the SH-60R. This tendency is a direct outgrowth of the experience born from the development of the original LAMPS Mk III; the close habitual relationship of the 'surface' navy with the 'airedales' in the helicopter community beginning in the 1970s resulted in an outstandingly successful marriage of dissimilar platforms operating harmoniously.

The Space and Naval Warfare Command has been tasked with the mission to oversee the research, development, production and procurement of the myriad of technologies needed to operationalize Network Centric Operations. But far from starting from square one, SPAWARS has been able to build upon the efforts of industry at home and abroad. The Navy traditionally has relied upon systems that data link data and voice to geographically dispersed units, with NTDS of the 1960s being the most visible and arguably most effective. Experiments in the 1990s with the Cooperative Engagement Capability (CEC) proved the viability of networking sensors and shooters in a dispersed environment, increasing the capabilities exponentially of surface and aviation assets. However, CEC was intended to be an anti-air engagement capability, and is thus just a small piece of the overall command and control problem facing a naval commander.

SPAWARS is applying information technology acquired from the information technology industry for its future systems, using COTS, with the potential to reduce overall costs to the Navy. Joint projects undertaken with the rest of the armed services have also lowered the projected life-cycle costs for systems that have uses across the military spectrum. New build-programs in both the aviation and surface communities are being designed to have the capabilities to operationalize NCO.

A sampling of some of the core hardware necessary to implement NCO as well as IT-21 from both shipboard and shore establishments are:

- Navy Tactical Data System (NTDS);
- Joint Operational Tactical System (JOTS);
- Officer in Tactical Command Information Exchange System (OTCIXS);
- Digital Wideband Transmission System (DWTS)[43]
- Global Broadcast Service (GBS)[44]
- UHF SATCOM[45]
- Automated Digital Network System (ADNS)[46]
- SVTC[47]
- SINCGARS[48]
- Global Command and Control System (GCCS)[49]

These various programs are funded at varying degrees through the current FYDP. NCO and IT-21 when complete will connect almost thirty different joint and service C^4I programs systems into one seamless network. Future models of the F/A-18E/F, the Joint Strike Fighter, as well as aircraft still on the drawing boards, are expected to have the capability to 'tap' into this system, using a single portal.

However, the SH-60R is to use the Common Data Link-Navy (CDL-N, formerly the Tactical Common Data Link (TCDL) as its portal. Meant to replace the current data link installed on board SH-60Bs, this link will interface with a planned and programmed shipboard terminal that allows the surface combatant to display, integrate and disseminate sensor and weapons data and imagery throughout C^4ISR (command, control, communications, computing and intelligence, surveillance and reconnaissance). Current funded requirements for the SH-60R's data linking capabilities are[50]:

-Ku-Band TCDL Compliant
-Operate in CEC Environment (will not have frequency interference problems)
-Simultaneous Down Link of Radar, Acoustic Data, ESM and Voice
-Provide hardware Interface for Ku Band TCDL Compliant UAVs (TSC)
-Commence production in FY 03

The downside to the current research and development program is that it will not allow the SH-60R to truly integrate into the 'net. The CDL-N may be a more robust and capable data link, but it retains the major limitation of the current data link by only allowing the capability to relay information between one surface unit and the aircraft, in this case the SH-60R. There is no capability programmed to allow for air-to-air transfer of data, imagery or voice.

The CDL-N is an effective first step. However, the need to ensure continuous and real-time networking between all naval aircraft and surface combatants (and eventually to all other sister service assets) is there, and seems to be a valid precondition to ensure that the Maritime Concept is valid and that Network Centric Operations remain viable. Currently, Link 16 is the standard data link for graphic interchange of data amongst U.S. and NATO airborne and C^2 platforms and it or its future derivative will be a key component in a networked C^4ISR system. Therefore, Link-16 or its follow-on is a valid requirement for installation aboard the SH-60R if the full capability of NCO is to be realized. As of this writing, Link 16 is not funded as part of the SH-60R development.

PROPOSED REORGANIZATION FOR NCO IMPLEMENTATION

As previously discussed, the future of the U.S. Navy helicopter community depends upon three co-dependent factors that parallel the RMA: fielding of the SH-60R with NCO connectivity, implementation of the doctrine embodied in the Maritime Concept, and a reorganization of the helicopter communities that support the shift from platform-centric operations to Network Centric Operations. Of these three, two are well advanced as discussed earlier in this paper. The third, an efficient reorganization, may prove the most difficult and costly to attain. In 1999, VADM Fallon, then COMSECONDFLT, commissioned a concept study that looked to improve the effectiveness of the entire Navy helicopter community.[51] The Second Fleet reorganization study was developed in parallel to work being done by N3/5 on the Maritime Concept as well as the studies looking to integrate existing and emergent systems into a network centric interface. This study proved controversial, not least due to its emphasis on breaking paradigms. These paradigms included command opportunities, equitable accession to flag rank, and the often-times contentious relationships between the helicopter and tactical communities. The study was exhaustive in its scope and resulted in a number of revisions that refined the original study but left the key conclusions intact.

The plan that holds the most promise for the implementation of NCO and the Maritime Concept is the realignment from four communities into just two, both deploying their command elements aboard the carrier. Current squadron organizations are:

- HS (helicopter antisubmarine squadron), flying the SH-60F aboard CVNs.
- HSL (helicopter antisubmarine squadron light), flying the SH-60B LAMPS.
- HC (helicopter utility squadron), flying the CH/HH/UH-46-series aboard supply ships.
- HM (helicopter mine hunting squadron); flying the MH-53E from shore.

The new MH-60S squadron would absorb a number of missions previously performed by the HS squadron (flying SH-60F/HH-60H aircraft) when deployed aboard a CVN as well as the utility mission traditionally performed by HC squadrons flying CH/HH-46-series aircraft. The MH-60S will have a high level of commonality in parts and interchangeability with the SH-60R airframe, reducing the need for greater numbers of stock numbers in the supply system.

The SH-60R is to replace the SH-60B LAMPS aircraft which currently deploys on the 'small boys' that accompany the carrier. Historically, a battle group's helicopter assets would be garnered from a number of HSL squadrons (whose command element remains shore-based) with various detachments embarking on the carrier's surface escorts, contributing to an awkward chain of command, at least in the eyes of the battle group commander. One of the stated intentions of the reorganization plan is to assign an entire LAMPS (or its derivative) squadron to a battle group rather than the traditional individual detachments and thus improve C^2, and of prime importance to this study, take advantage of the networking improvements provided through NCO. Efficiencies and effectiveness will come from the helicopter squadron's CO's real-time access to the battle group staff (and vice versa) and direct command over the helicopter detachments in company with the CVN (vice purely administrative if the command element is shore-based). Despite a future of networked command and control, it is unrealistic (due to funding constraints) to expect the shore-based CO of a helicopter squadron to have access to systems necessary to provide meaningful influence on members of his command when they are deployed.

THE SH-60R AS FORCE MULTIPLIER?

But, will the Romeo become a strategic force multiplier for the Navy? The answer to this important question has been indirectly answered by the preceding sections - No. Simply applying doctrine and reorganization to a platform, in this case the SH-60R, cannot expand the reach of sensors, weapons and presence that are so important in naval operations.

Individual surface combatant warships with their embarked helicopters concurrently deployed world-wide are not truly utilized in a strategic sense since they do not possess the capability to tie the helicopter's weapons or sensors into the proposed C^4ISR net. While all

surface combatants will eventually have the requisite systems necessary to operationalize NCO, their organic sensor range is still physically limited.

However, with the introduction of an NCO-capable SH-60R, one with the technological 'tie-in' to the 'net, this would change. Our naval presence and awareness would increase by a significant degree. The ability of a helicopter to range 360° from a naval unit, with sensors seeing an additional 150-200 nautical miles would enhance the overall awareness. No longer necessarily centered on the carrier and its embarked air wing, data theater-wide (as well as globally) can be shared from all properly-equipped naval ships and aircraft, manned and unmanned, rotary as well as fixed wing. With over 115 surface combatants in the Navy (of which almost 90 are helicopter-capable), the reader can appreciate the increase in coverage as well as data-sharing that can be realized. Providing a Link 16-type of data link in addition to the funded CDL-N would allow the SH-60R to be a true participant in the C^2 network architecture of the future.

CONCLUSION

It is the opinion of the writer that Network Centric Operations are a part of the Revolution in Military Affairs, having the necessary components of doctrine, technology and organization. First, NCO is being applied by naval doctrinal thinkers. It is being introduced by concept publications, such as the Maritime and Capstone Concepts, papers published in trade journals, as well as a comprehensive integration involving the entire spectrum of naval infrastructure and architecture. Second, the technological interfaces that are necessary for 'net tie-in are being incorporated from the beginning of their design and manufacture, with few exceptions (the SH-60R), not after their deployment to fleet units. Next-generation aviation projects such as the Joint Strike Fighter, F/A-18E/F Super Hornet and the UCAV (unmanned combat aerial vehicle), and surface units such as the DD-21 and San Antonio-class LPD-17 are being designed to be NCO-compliant, with additional growth available. Third, Naval Aviation is reorganizing as necessary to provide the third component to complete RMA.

Slowly, but surely, the capabilities inherent in NCO are trickling down to the deckplates. More and more periodicals address what NCO means to the future of the Navy and how our doctrine is to evolve. In 2000 and 2001, multiple articles specifically address how our ships and aircraft need to be modified or designed afresh to allow access to NCO. The SH-60R program, though faced with significant (but not insurmountable) technical challenges, is an excellent example of how a platform centric asset could be transformed into a network centric one. Naval

Aviation has identified the Romeo program as an important aviation program, but has not provided it with the capability to take advantage of the future NCO architecture.

The introduction of the Romeo into the fleet beginning in the latter half of this decade could have decided operational impact on how the Navy fights, if leadership provides the aircraft, the community and the surface fleet, to include the aircraft carriers, the tools necessary to take advantage of NCO. Taking advantage of the ongoing Revolution in Military Affairs allows forward thinkers among senior Navy leaders to develop the Network Centric Operations concept and propose how best to apply it to naval operations. The vision espoused so articulately by VADM Cebrowski and others can achieve reality, given continued research and development as well as adequate funding.

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ENDNOTES

[1]Arthur K. Cebrowski, "President's Forum," Naval War College Review, Winter 2001, 1.

[2]See the Naval Space and Naval Warfare Command's (SPAWARS) excellent web-site, http://enterprise.spawar.navy.mil/spawarpublicsite/ or up-to-date information regarding the Navy's research and development on C^4ISR.

[3]U.S. Navy, Naval Amphibious Warfare Plan: "Decisive Power from the Sea" (Washington, D.C.: Department of the Navy, 1999), 74.

[4]The term "legacy navy" refers to the platforms, sensors, weapon systems, doctrine and organizations that currently exist today.

[5]U.S. Navy, Naval Warfare: Naval Doctrine Publication 1 (Washington, D.C.: Department of the Navy, 1994), 35.

[6]U.S. Navy, The Maritime Concept (Washington, D.C.: OPNAV N3/5 draft, 2000), 2.

[7]U.S. Navy, Network Centric Operations: A Capstone Concept for Naval Operations in the Information Age (Washington, D.C: OPNAV N3/5 unpublished smooth draft, 2000), 8.

[8]Ibid, 9.

[9]John J. Garstka, Network Centric Warfare: Developing and Leveraging Information Superiority (Washington, D.C.: DoD Cooperative Research Program 2000), 175..

[10]U.S. Navy, Network Centric Operations, 10.

[11]Rapid Decisive Operations (RDO) was briefed by Dr. Williamson Murray, National Defense University, to the U.S. Army War College Advanced Strategic Art Program seminar.

[12]U.S.Navy, Network Centric Operations, 10.

[13]Ibid, 11.

[14]Ibid, 9.

[15]Ibid, 18.

[16]bid, 17.

[17]Garstka, Network Centric Warfare, 199.

[18]U.S.Navy, Network Centric Operations, 16.

[19]Ibid, 14.

[20]Ibid, 18.

[21]Gartska, Network Centric Warfare, 67.

[22]Ibid, 80.

[23]Jay L. Johnson, "The Navy in 2010: A Joint Vision," Joint Forces Quarterly, Winter 1996-1997, 17.

[24]U.S. Navy, Vision...Presence...Power: A Program Guide to the U.S. Navy (Washington, D.C.: Department of the Navy, 2000), 10.

[25]U.S. Navy, The Maritime Concept (Washington, D.C.: OPNAV N3/5 draft document, April 2000), 1.

[26]Ibid, 2.

[27]Ibid, 1.

[28] U.S. Navy, Naval Warfare: Naval Doctrine Publication 1, 20.

[29]Ibid, 24.

[30]U.S. Navy, Network Centric Operations, 6.

[31]See John R. Boyd, "A Discourse on Winning and Losing" (Maxwell AFB, Ala.: Air Univ. Press, August 1987). Also see "Network Centric Warfare - What's the Point?", Edward A. Smith, Jr., Naval War College Review, Winter 2001, 6-14, for an excellent explanation of 'getting inside the OODA loop.'

[32] U.S. Navy, Naval Warfare: Naval Doctrine Publication 1, 20.

[33] Gartska, Network Centric Warfare, 3.

[34] U.S. Navy, The Maritime Concept, 3.

[35]Ibid, 12.

[36]United State Navy, United States Naval Aviation: 1910-1995 (Washington D.C.: Naval Aviation History Office, 1996), 146.

[37]Ibid, 169.

[38]The "R" represents "remanufactured", subject to change if the design becomes a new-buy program.

[39]Plane guard" refers to an airborne helicopter (or a trailing escort ship) which is positioned in the vicinity of the carrier in order to recover aircrew that may be forced down into the sea.

[40]At the time of this writing, procurement had slid to the right as far as numbers procured in the FYDP 'out years'. A study (to be completed in April 2001) is ongoing that will decide whether or not to purchase newly manufactured aircraft, rather than proceed with the remanufacturing program.

[41]U.S. Navy, "C2F Helicopter Community Reorganization Plan" (NS Norfolk: COMSECONDFLT, February, 2000), A-1.

[42]Ibid, 2-2-3.

[43]Digital Wideband Transmission System (DWTS) is a secure digital UHF wideband capability for voice, imagery and data transfer among the ships of the BG and ARG as well as forces ashore – interoperable with Army and Marine Corps systems

[44]Global Broadcast Service (GBS) is a high speed broadcast video and data service to deployed, in transit and shore forces at tactical, operational and strategic levels. Continuous one-way flow of high volume information.

[45]UHF SATCOM provides high data rates over Demand Assigned Multiple Access (DAMA) channels.

[46]Automated Digital Network System (ADNS) COTS and GOTS secure system with a C4I Internet-type system.

[47]Secure Video Teleconferencing system.

[48]SINCGARS is the standard secure anti-jamming VHF radio with proven interoperability with Joint and allied forces.

[49]Global Command and Control System (GCCS) provides a fused, real-time common operational picture of the battlespace for all automated C2 functions.

[50]U.S. Navy, "Tactical Common Data Link Development Status" (NAS Patuxent River, MD, briefing slides presented to the Naval Aviation Interoperability Assurance Office (NAIAO), 16 January 2001), 20.

[51]U.S. Navy, "C2F Helicopter Community Reorganization Plan."

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